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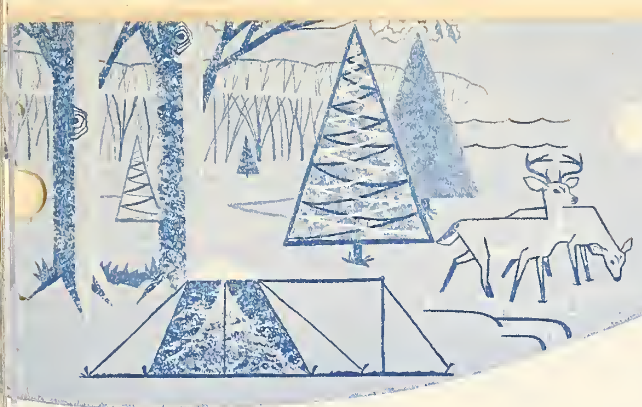

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Duration of Percolation From a Loess Soil[1]

Until fairly recently it was generally believed that gravitational water drained from a soil profile quite rapidly — in a few hours', or at most, a few days' time. It was further believed that at the end of this period of rapid drainage the soil was at field capacity, and that percolation then ceased abruptly.

That water is discharged from loess soils over extended periods of time is shown by the record from a series of lysimeters that were operated near La Crosse, Wis., in the 1930's. The data, not analyzed until recently, confirm the observations of Nixon and Lawless[2] in California for soils *in situ* and those of Hewlett[3] in North Carolina for soils in a model. This phenomenon helps explain why streams continue to supply a base flow during long periods without rainfall.

The lysimeters were 20 feet long, 10 feet wide, and 4 feet deep. They were filled with undisturbed subsoil blocks plus a layer of topsoil, both of Fayette silt loam. This is a well-drained, loessel soil that is commonly found on the ridges and upper slopes of Wisconsin's "Driftless Area."

Percolate normally flowed from the lysimeters only during the spring thaw period, when soil moisture was at a high level and melting snow provided a continuing supply of water. Percolate flowed in the summer and fall seasons but rarely. This was because rain that infiltrated the soil during summer and fall months normally was held in the soil, replenishing moisture losses from evapotranspiration.

Since rains fell at frequent intervals during the spring season, there was only limited opportunity during the years of the experiment to study soil drainage during long rainless periods. Percolation did occur a few times, however, during extended periods without soil moisture recharge. During these periods percolate flowed continuously for as long as 20 days without additional rainfall (fig. 1). Vegetation on the lysimeter was a seedling stand of red and white oak and black walnut, and the soil was covered with a layer of hardwood leaf litter. Thus losses from evapotranspiration were minimal during the periods shown. If percolation can flow for 20 days from the 4-foot soil mass of a lysimeter without recharge, it is conceivable indeed that drainage from the much greater soil mass of natural watersheds could supply the flow of streams for much longer periods.

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April 1964

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Research Forester
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[1] *Reported by the Station's field headquarters in LaCrosse, Wis., where research is conducted in cooperation with the Wisconsin Conservation Department.*

[2] *Nixon, Paul R., and Lawless, G. P. Translocation of moisture with time in unsaturated soil profiles. Jour. Geophys. Res. 65: 655-661, illus. 1960.*

[3] *Hewlett, John D. Soil moisture as a source of base flow from steep mountain watersheds. U.S. Forest Serv., Southeast. Forest Expt. Sta., Sta. Paper 132, 11 pp., illus. 1961.*

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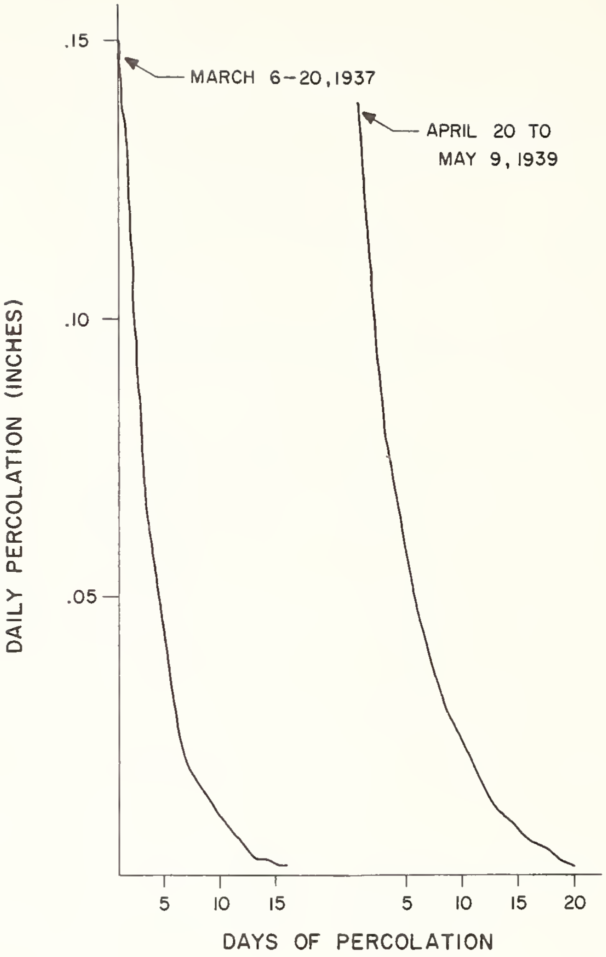

FIGURE 1. — Duration of soil moisture drainage during periods without recharge.